



## National Highway Traffic Safety Administration

[Docket No. NHTSA-2019-0082]

### Agency Information Collection Activities; Notice and Request for Comment; Drivers' Use of Camera-Based Rear Visibility Systems Versus Traditional Mirrors

**AGENCY:** National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

**ACTION:** Notice and request for comments on a request for approval of a new collection of information.

**SUMMARY:** The National Highway Traffic Safety Administration (NHTSA) is re-issuing an announcement of our intention to request the Office of Management and Budget's (OMB) approval of a proposed collection of certain information by the Agency. Before a Federal agency can collect certain information from the public, it must receive approval from OMB. Procedures established under the Paperwork Reduction Act of 1995 (the PRA) require Federal agencies to publish a notice in the Federal Register concerning each proposed collection of information and to allow 60 days for public comment in response to the notice. The proposed collection of information supports research addressing safety-related aspects of drivers' use of camera-based rear visibility systems intended to serve as a replacement for traditional mirrors. On August 28, 2019, NHTSA published a notice in the Federal Register Notice soliciting public comments with a 60-day comment period. NHTSA received 22 public comments submitted to the docket and one additional comment submitted via e-mail. Given the extended time period since the initial publication of that notice, NHTSA is publishing this new 60-day notice. This new notice addresses comments received on the original 60-day notice relevant to the current study design.

**DATES:** Comments must be received on or before **[INSERT DATE 60 DAYS AFTER THE DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

**ADDRESSES:** You may submit comments identified by the docket number in the heading of this document or by any of the following methods:

- *Federal eRulemaking Portal:* Go to <http://www.regulations.gov>. Follow the instructions for submitting comments on the electronic docket site by clicking on “Help” or “FAQ”.
- *Mail or Hand Delivery:* Docket Management, U.S. Department of Transportation, 1200 New Jersey Avenue SE, West Building, Room W12-140, Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except on Federal holidays. To be sure someone is there to help you, please call (202) 366-9322 before coming.
- *Fax:* 202-493-2251.

*Instructions:* Each submission must include the Agency name and the Docket number for this Notice. Note that all comments received will be posted without change to [www.regulations.gov](http://www.regulations.gov), including any personal information provided. Please see the Privacy heading below.

*Privacy Act:* Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, *etc.*). You may review DOT’s complete Privacy Act Statement in the *Federal Register* published on April 11, 2000 (65 FR 19477–78) or you may visit <http://www.dot.gov/privacy.html>.

*Docket:* For access to the docket to read comments received, go to <http://www.regulations.gov>, or the street address listed above. Follow the online instructions for accessing the dockets.

**FOR FURTHER INFORMATION CONTACT:** Elizabeth Mazzae, Applied Crash Avoidance Research Division, Vehicle Research and Test Center, NHTSA, 10820 State Route 347—Bldg. 60, East Liberty, Ohio 43319; Telephone (937) 666-4511; Facsimile: (937) 666-3590; e-mail address: [elizabeth.mazzae@dot.gov](mailto:elizabeth.mazzae@dot.gov).

**SUPPLEMENTARY INFORMATION:** Under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501–3520), before an agency submits a proposed collection of information to OMB for approval, it must first publish a document in the Federal Register providing a 60-day comment period and otherwise consult with members of the public and affected agencies concerning each proposed collection of information. The OMB has promulgated regulations describing what must be included in such a document. Under OMB’s regulation (at 5 CFR 1320.8(d)), an agency must ask for public comment on the following: (i) Whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility; (ii) the accuracy of the agency’s estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used; (iii) how to enhance the quality, utility, and clarity of the information to be collected; (iv) how to minimize the burden of the collection of information on those who are to respond, including the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g. permitting electronic submission of responses. In compliance with these requirements, NHTSA asks for public comments on the following proposed collection of information:

*Title:* Drivers’ Use of Camera-Based Rear Visibility Systems Versus Traditional Mirrors

*OMB Control Number:* New.

*Form Numbers:* NHTSA forms 1553, 1554, 1555, 1556, 1557, 1558

*Type of Request:* New collection.

*Type of Review Requested:* Regular.

*Requested Expiration Date of Approval:* Three years from date of approval.

*Summary of the Collection of Information:*

NHTSA proposes to perform research involving the collection of information from the public as part of a multi-year effort to learn about drivers’ use of camera-based indirect visibility systems as compared to their use of traditional rearview mirrors. This research is focused on

examination of passive camera-based rear visibility systems, which are systems intended to perform the same function as traditional mirrors: displaying areas surrounding the vehicle. Systems performing detection of objects within the system's field of view and providing visual or other alerts to the driver are not being examined in this research.

The research will involve human subjects testing involving driving instrumented vehicles on a test track and public roads. Testing will also be performed with participants seated in a stationary vehicle while detecting nearby objects using a vehicle's mirrors or a camera-based system. Study participants will be members of the general public and participation will be voluntary and compensated. The goal is to characterize drivers' eye glance behavior, visual object detection performance, and driving performance while operating a vehicle equipped with traditional outside mirrors versus a vehicle equipped with a camera-based visibility system in place of vehicle mirrors. Stationary examination of drivers' ability to detect objects near a vehicle will also be conducted. This research will support NHTSA decisions relating to safe implementation of electronic visibility technologies that may be considered for use as alternatives to meet Federal Motor Vehicle Safety Standard (FMVSS) No. 111 mirror requirements.

Research participants will be members of the public, non-vision-impaired, and licensed car drivers and/or truck drivers.<sup>1</sup> Participants will drive a test vehicle equipped with a camera-based system in place of outside rearview mirrors, an original equipment outside rearview mirror system, or a combination of both. The research will involve track-based and on-road, semi-naturalistic driving in which participants will drive vehicles in multi-lane traffic scenarios while using the outside rearview mirrors or alternative system during lane changes and other typical driving situations. A portion of testing will take place in dark (i.e., nighttime or early morning) driving conditions to permit examination of system performance and drivers' use of systems in

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<sup>1</sup> Should this initial research determine average-sighted drivers perform at least as well driving with camera-based systems as with traditional outside mirrors, NHTSA will consider what remaining issues may warrant research with regard to sight-impaired drivers.

those conditions. As noted above, a portion of the testing will also take place with the vehicle stationary. Separate, but similar data collections will be conducted for passenger cars and heavy trucks.

Since qualitative feedback or self-reported data is not sufficiently robust for the purpose of investigating driver performance and interaction issues with advanced vehicle technologies, the primary type of information to be collected in this research is objective data consisting of video and engineering data recorded as participants drive instrumented study vehicles. Recorded objective data will include driver eye glance behavior and lane change performance. Eye glance behavior will reveal how drivers' visual behavior in a vehicle equipped with a camera-based rear visibility system differs from drivers' visual behavior in a vehicle equipped with traditional outside mirrors. Lane change performance will be characterized based on vehicle speed, inter-vehicle distances during lane changes, and time to complete lane changes. Lane change performance in a vehicle equipped with a camera-based rear visibility system will be compared to lane change performance observed in a vehicle equipped with traditional outside mirrors. Vehicles will be fitted with instrumentation for recording driver eye glance behavior, as well as vehicle speed, position, steering angle, and turn signal status.

This research will also involve information collection through participant screening questions and post-drive questionnaires. Questions will be asked during the course of the research to assess individuals' suitability for study participation, to obtain feedback regarding participants' use of the camera-based rear visibility systems, and to gauge individuals' level of comfort with and confidence in the technologies' performance and safety.

#### *Description of the Need for the Information and Proposed Use of the Information:*

The National Highway Traffic Safety Administration's (NHTSA) mission is to save lives, prevent injuries, and reduce economic costs associated with motor vehicle crashes. As new vehicle technologies are developed, it is prudent to ensure that they do not create any unintended

decrease in safety. The safety of passive visibility-related technologies depends on both the performance of the systems and on drivers' ability to effectively and comfortably use the systems. This work seeks to examine and compare drivers' eye glance behavior and aspects of driving behavior for traditional mirrors and camera-based systems intended to replace rearview mirrors.

The collection of information will consist of: (1) Question Set 1, Driving Research Study Interest Response Form, (2) Question Set 2, Candidate Screening, (3) passive observation of driving behavior, and (4) Question Set 3, Post-Drive Questionnaire: Drive with Camera-Monitoring System, (5) Question Set 4, Post-Drive Questionnaire: Drive with Traditional Mirrors, (6) Question Set 5, Post-Drive Questionnaire Final Opinions.

The information to be collected will be used for the following purposes:

- *Question Set 1, Driving Research Study Interest Response Form* will be used to determine individuals' willingness to participate in the study and whether an individual qualifies for participation in this study based on certain information. For example, participants must:
  - Be 25 to 65 years of age, inclusive
  - For drivers of passenger cars: Hold a valid U.S. driver's license
  - For drivers of heavy trucks: Hold a valid U.S. commercial driver's license
- *Question Set 2, Candidate Screening Questions* will be primarily used to ensure that participants meet certain minimum health qualifications, are free of recent criminal convictions, and have reasonable availability to participate in the study. The objective of the health screening questions is to identify candidate participants whose physical and health conditions may be deemed "average" and are compatible with being able to drive continuously for up to 3 hours a vehicle equipped with only original equipment components.

- *Question Set 3, Post-Drive Questionnaire* will be used to get information about the participants' experiences during the experimental drive, including their degree of comfort in using the camera-based system. There will be different versions of the questionnaire for light vehicle and truck drivers, but both will be designed to require not more than 15 minutes to complete all questions. Participants will complete the Question Set 3 post-drive questionnaire one time for mirrors and one time for the camera-based rear visibility system.

*Affected Public (Respondents):* Research participants will be licensed drivers aged 25 to 65 years of age, inclusive, are in good health, and do not require assistive devices to safely operate a vehicle and drive continuously for a period of approximately 3 hours.

*Estimated Number of Respondents:* The data collection will have two parts: one involving light vehicles that will begin immediately upon receipt of PRA clearance and a second, subsequent part will involve heavy trucks. The second part of the data collection will have the same general approach involving assessment of eye glance behavior and lane change performance as a function of visibility technology (i.e., camera-based system or traditional rearview mirrors).

Information for both parts of the data collection will be obtained in an incremental fashion to permit the determination of which individuals have the necessary characteristics for study participation. All interested candidates will complete Question Set 1, Driving Research Study Interest Response Form. A subset of individuals meeting the criteria for Question Set 1 will be asked to complete Question Set 2, Candidate Screening Questions. From the individuals found to meet the criteria for both Questions Sets 1 and 2, a subset will be chosen with the goal of achieving a sample providing a balance of age and sex to be scheduled for study participation. Both data collection parts together will involve approximately 750 respondents for Question Set 1 and 325 for Question Set 2. Question Sets 3, 4, and 5 will each have 150 respondents of which

110 will be assigned to the light vehicle category and 40 to the heavy vehicle category. A summary of the estimated numbers of individuals that will complete the noted question sets across both the first and second data collection parts is provided in the following table.

### **Estimated Number of Respondents**

<b>Question Set No.</b>	<b>NHTSA Form No.</b>	<b>Questions</b>	<b>Participants (i.e., Respondents)</b>
1	1553	Interest Response Form	750
2	1554	Candidate Screening Questions	375
3	1556	Post-drive Questionnaire: Drive with Camera-Monitoring System	200
4	1557	Post-drive Questionnaire: Drive with Traditional Mirrors	200
5	1558	Post-Drive Questionnaire Final Opinions	200

*Frequency of Collection:* The data collection described will be performed once to obtain the target number of 180 valid test participants. Assuming typical data loss rates for instrumented vehicle testing with human subjects, it is anticipated that 200 participants will need to be run in order to obtain 180 valid participant datasets.

*Estimated Total Annual Burden Hours:* 190 hours

Completion of Question Set 1, Driving Research Study Interest Response Form is estimated to take approximately 5 minutes and completion is estimated to take approximately 7 minutes for Question Set 2, Candidate Screening Questions. Completion of Question Sets 3 and 4, Post-Drive Questionnaire: Drive with Traditional Mirrors for light or heavy vehicles, is estimated to take 10 minutes for each survey for a combined total of 20 minutes per participant. Estimated completion time for the final opinions questions for both parts of the data collection is 5 minutes and each participant will complete the questionnaire two times.

The estimated annual time and cost burdens across both the first and second data collection parts are summarized in the table below. The number of respondents and time to complete each question set are estimated as shown in the table. The time per question set is calculated by multiplying the number of respondents by the time per response and then



converting from minutes to hours. The hour value for each question set is multiplied by the latest average hour earning estimate from the Bureau of Labor Statistics<sup>2</sup> to obtain an estimated burden cost per question set.

### Estimated Time per Response and Total Time

Question Set No.	NHTSA Form No.	Question Set Titles	Participants (i.e., Respondents)	Time per Response (Minutes)	Total Time (Minutes)	Total Burden Time (Hours)	Total Cost
1	1553	Interest Response Form	750	5	3750	63	\$1,784.16
2	1554	Candidate Screening Questions	375	7	2625	44	\$1,246.08
3	1556	Post-Drive Questionnaire: Drive with Camera Monitoring System	200	10	2000	33	\$934.56
4	1557	Post-Drive Questionnaire: Drive with Traditional Mirrors	200	10	2000	33	\$934.56
5	1558	Post-Drive Questionnaire Final Opinions	200	5	1000	17	\$481.44
		<b>TOTAL Estimated Burden:</b>			11,375	190	\$5,380.80

### *Estimated Total Annual Burden Cost:*

NHTSA estimates that there are no additional costs to respondents.

### *Comments Received on the Original 60-Day Notice:*

On August 28, 2019, NHTSA published a 60-day notice requesting public comment on the proposed collection of information.<sup>3</sup> We received comments from 23 entities, including 8 organizations and 15 individuals. Organizations submitting comments included American Bus Association (ABA), Automotive Safety Council, Commercial Vehicle Safety Alliance (CVSA), Lotus Cars Ltd., Greyhound Lines, Inc., Stoneridge Inc., Volvo Group, and ZF North America, Inc. Of the 23 commenters, 17 were supportive of the research. No comments addressed the specific questions to be asked of participants.

<sup>2</sup> Bureau of Labor Statistics Feb. 2019 Average Hourly Earnings data for “Total Private,” \$27.66 (Accessed 3/8/2019 at <https://www.bls.gov/news.release/empsit.t19.htm>.) The Bureau of Labor Statistics estimates that for private industry workers, wages represent 70.1% of total compensation. Employer Costs for Employee Compensation-March 2019, (Assessed 7/31/2019 at <https://www.bls.gov/news.release/pdf/ecec.pdf>).

<sup>3</sup> 84 FR 45209 (August 28, 2019).

Several suggestions for expanding the research were provided. These suggestions are summarized briefly below, together with NHTSA's response.

1. Some commenters recommended that the vehicle types to be examined be expanded. Greyhound Lines, Inc. and Volvo Group requested that NHTSA include over-the-road (coach) buses and transit buses in the heavy vehicle testing. American Bus Association requested that we expand this research to include all types of commercial motor vehicles, including both property- and passenger-carrying light vehicles. While it is not possible to include all vehicle types in the current research effort, NHTSA will consider these other vehicle types for inclusion in subsequent work.
2. The Automotive Safety Council also recommended that we evaluate the impact of different ambient light levels (e.g., day and night conditions). NHTSA notes that the research will involve observation of drivers' eye glance behavior and use of camera-based visibility systems during daytime and nighttime conditions.
3. The Automotive Safety Council also requested drivers be given enough time to get acclimated to using the camera-based rear visibility systems. In conducting the research NHTSA will consider driver acclimation time to the extent possible.
4. The Automotive Safety Council recommended that this study attempt to understand driver preference for monitor size and position, and the impact of system frame rate or latency. The Automotive Safety Council also suggested we investigate reaction times associated with various monitor layouts (assumed to mean visual display mounting locations). Systems to be involved in the research will be production or industry-developed prototype designs. As such, the system configurations to be tested will be constrained by the particular systems that NHTSA is able to obtain for this research.

5. The Automotive Safety Council suggested the study include measures of eye glance behavior and mental effort, and evaluate the time and effort needed for the driver to refocus from exterior objects to the visual display of a camera-based rear visibility system. NHTSA is interested in learning about whether average drivers are able to refocus and extract information from a camera-based system's visual display as compared to a traditional mirror. The research will involve at least an initial examination of this issue.
6. Recommendations were made to include vision-impaired research participants  
  
The Automotive Safety Council and ZF North America, Inc. requested that NHTSA include vision-impaired participants requiring prescription glasses, including far-sighted drivers who do not wear glasses for driving. Additionally, the Automotive Safety Council requested we include blind in one eye, elderly, and limited-mobility drivers. NHTSA's immediate approach is to gather information to determine whether camera-based rear visibility systems should be allowed as an alternative to current FMVSS No. 108 outside mirror requirements. We anticipate traditional mirror equipment to continue to be available for human-operated vehicles for the foreseeable future. As such, this research will assess how average-sighted drivers are able to use camera-based systems as compared to traditional outside mirrors when driving and determine whether these systems, at a minimum, do not decrease safety for the majority of drivers. Should this initial research determine average-sighted drivers perform at least as well driving with camera-based systems as with traditional outside mirrors, NHTSA will consider what remaining issues may warrant research with regard to sight-impaired drivers.
7. The Automotive Safety Council suggested we identify the benefits of a larger field of view, such as improvements in blind spot detection, especially for limited-mobility drivers. The characteristics of camera-based visibility systems involved

in this research will be limited to production or prototype systems available to NHTSA for lease or purchase during the period of performance of the research project. It is unlikely that technology options will be available that would allow for objective testing needed to fully consider these issues.

8. The Automotive Safety Council also suggested examining the use of different cues to determine the most effective way to get the drivers' attention. However, the type of system to be examined in this research does not involve provision of any type of driver alert. Camera-based rear visibility systems to be examined in this research are those intended to perform a function equivalent to traditional mirrors. Performing detection of objects within the system's field of view and providing visual or other alerts to the driver, similar to a blind spot monitoring system, is not a function being examined in this research.
9. ZF North America, Inc. suggested we investigate an integrated display view with the side and rear camera systems combined in one display. NHTSA's primary goal in this initial research is to examine camera-based systems that serve to provide a direct replacement for required outside mirror equipment. Pending the outcome of the initial research, additional research may be undertaken to examine alternative system configurations.
10. Some commenters requested that particular system characteristics be examined in this work. ZF North America suggested that NHTSA consider adding embedded image processing functions and technology to camera-based rear visibility systems to avoid poor visibility issues, including weather and lighting conditions that could deteriorate field of view. Two commenters, including ZF North America, Inc., recommended drivers be offered a level of control over the cameras, such as camera panning and zoom. ZF North America, Inc. also suggested that the camera and visual display be placed at the same height on the

vehicle to avoid driver disorientation. As stated above, the systems to be involved in this research will be limited to those available for lease from automotive manufacturers or suppliers during the term of this work.

11. Commercial Vehicle Safety Alliance (CVSA) requested that NHTSA consider the non-driving related safety impacts of replacing mirrors with camera-based rear visibility systems in the context of law enforcement and roadside inspections. For example, law enforcement officers use traditional mirrors to enforce safety regulations like seatbelt use and traditional mirrors help ensure inspector safety during roadside inspections. Additionally, CVSA also requested NHTSA consider vehicle width laws before replacing mirrors with camera-based rear visibility systems. NHTSA's initial research will focus on whether drivers are able to safely use camera-based systems that provide direct replacement for required outside mirror equipment. Should the initial review find camera-based systems to be a reasonable alternative to traditional outside mirrors, additional impacts of allowing such electronic systems will be considered.

All of the 15 individuals who submitted comments addressed their preference for or against allowing camera-based rear visibility systems rather than indicating whether they support the conduct of the proposed research and content of the information collection. Three commenters stated camera-based visibility systems should be allowed on vehicles but not required. One individual stated camera-based visibility systems should supplement but never replace traditional mirrors.

Seven individuals indicated their belief that camera-based rear visibility systems have inherent disadvantages as compared to traditional mirrors. The disadvantages noted include a requirement for power, lower reliability, more limited operating conditions than mirrors, environmental debris on camera lens degrades image quality, higher cost, a higher likelihood of a need for regular maintenance, and more difficult maintenance. Additional concerns noted by

commenters about replacing traditional mirrors with camera-based rear visibility systems include:

1. Camera-based rear visibility systems' displays will make driving unsafe, as compared to traditional mirrors.
2. Drivers will not be able to easily acclimate to using the visual displays of camera-based rear visibility systems and different display locations (if applicable).
3. Camera-based rear visibility systems and new technology will further remove the human from the driving task.
4. Concerns about camera-based rear visibility systems' ability to function reliably and that cameras requiring power can fail unexpectedly and cause a lack of awareness of the drivers' surroundings, while traditional mirrors cannot.
5. Concerns camera-based rear visibility systems would be more difficult for law enforcement to determine if they are working correctly, as compared to traditional mirrors for which damage can be easily determined.

In summary, the proposed research is intended to gather information to address the question of whether camera-based rear visibility system use is as safe as that of traditional mirrors through examination of drivers' eye glance behavior and driving performance. However, issues such as reliability and law enforcement impacts are outside of the scope of this initial work. NHTSA appreciates the feedback and many relevant suggestions offered regarding additional experimental conditions to consider. NHTSA will consider the provided suggestions as input for follow-on research programs.

**PUBLIC COMMENTS INVITED:** You are asked to comment on any aspects of this information collection, including (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Department, including whether the information will have practical utility; (b) the accuracy of the Department's estimate of the burden of the proposed information collection; (c) ways to enhance the quality, utility and clarity

of the information to be collected; and (d) ways to minimize the burden of the collection of information on respondents, including the use of automated collection techniques or other forms of information technology.

**Authority:** The Paperwork Reduction Act of 1995; 44 U.S.C. Chapter 35, as amended; and 49 CFR 1.95.

Issued in Washington D.C.

**Cem Hatipoglu**

*Associate Administrator for Vehicle Safety Research.*

[Billing Code 4910-59-P]

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